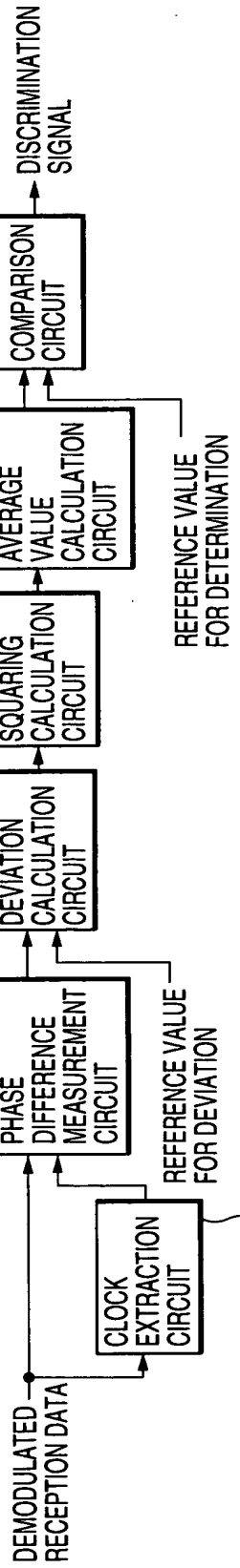


FIG. 1 PRIOR ART

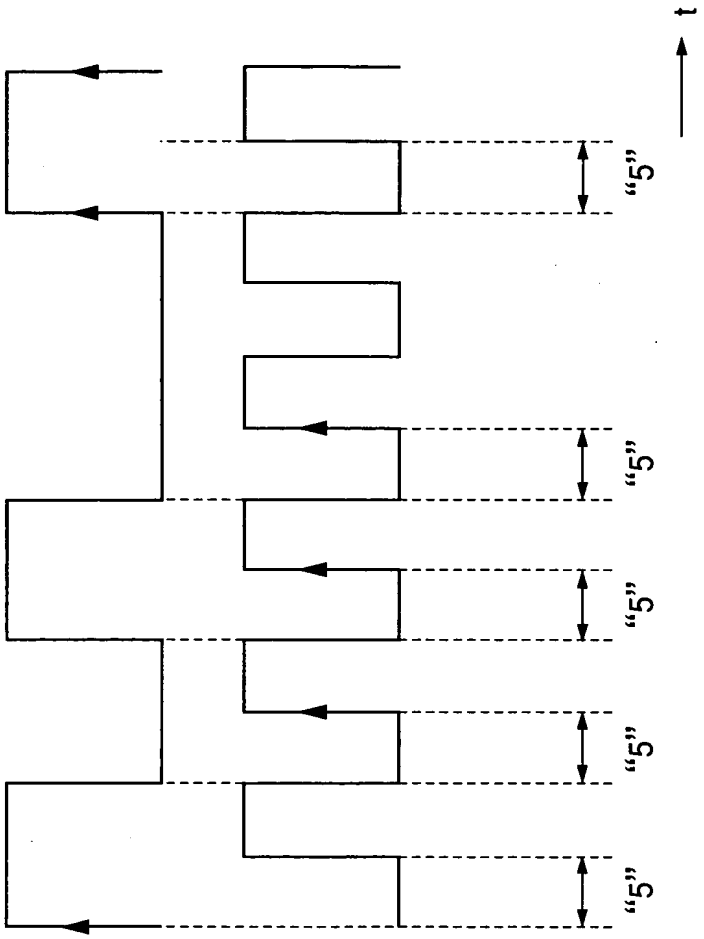


FIG. 2A
PRIOR ART

FIG. 2B
PRIOR ART

FIG. 2C
PRIOR ART

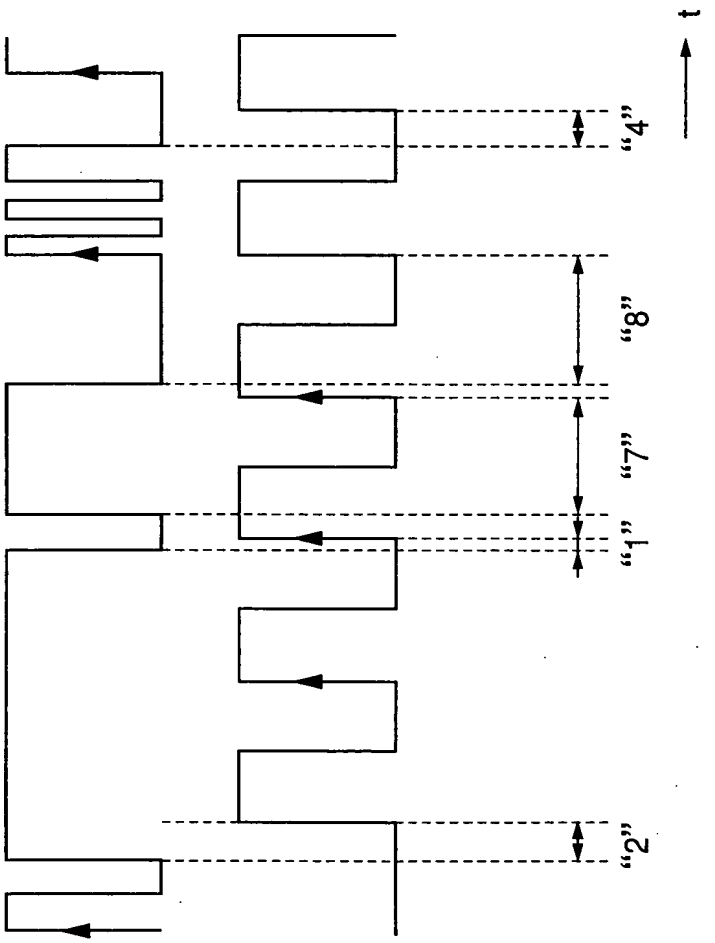


FIG. 3A
PRIOR ART

FIG. 3B
PRIOR ART

FIG. 3C
PRIOR ART

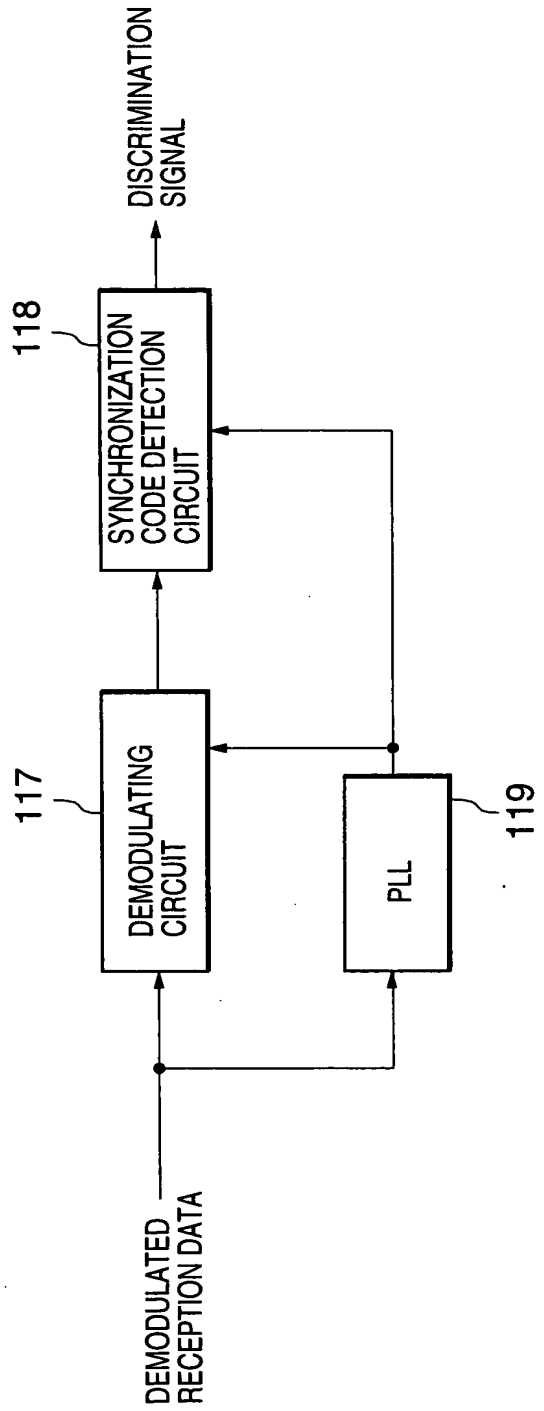


FIG. 4 PRIOR ART

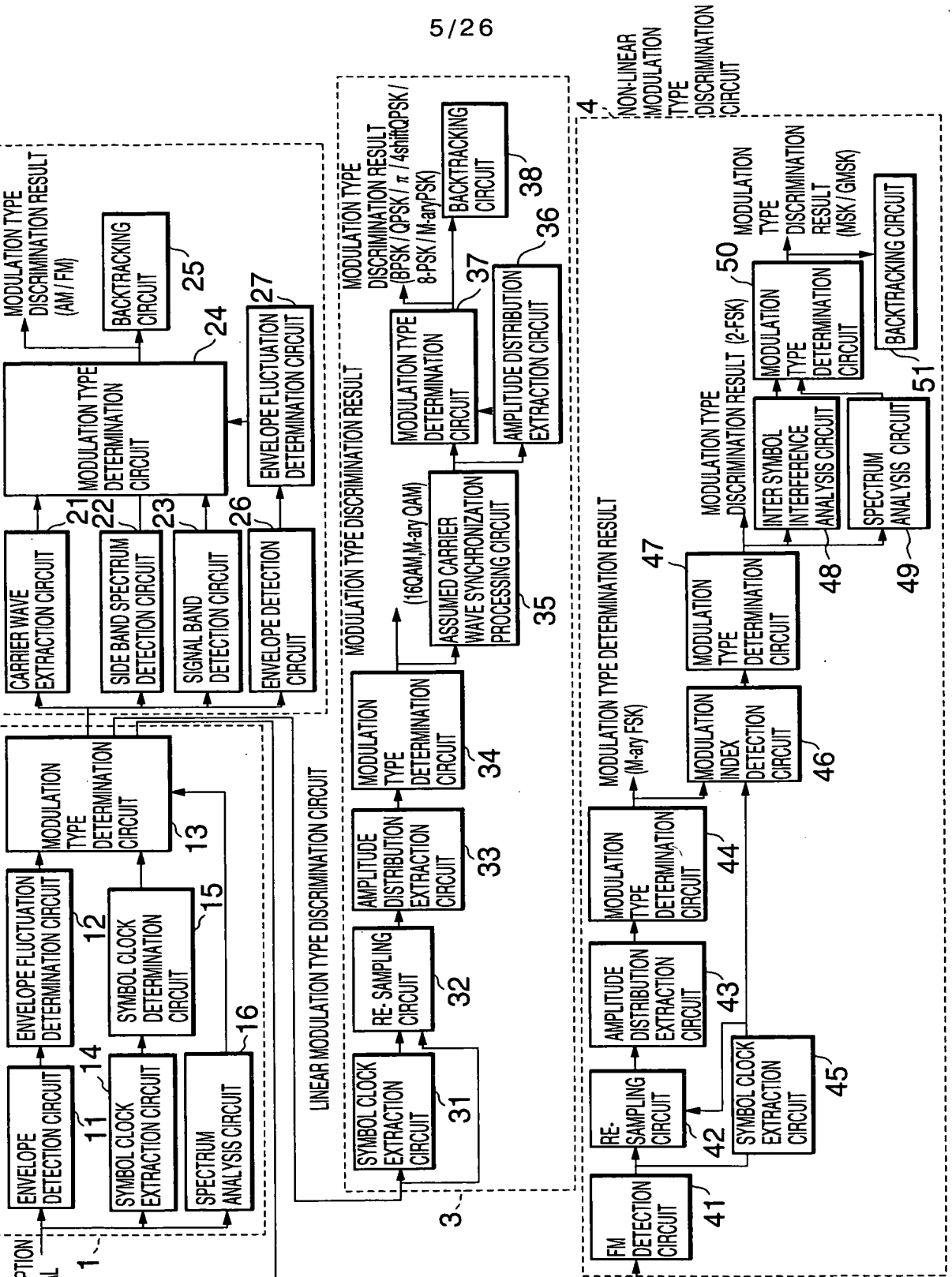

RECEPTION SIGNAL
1
ANALOG / DIGITAL MODULATION TYPE DISCRIMINATION CIRCUIT
ENVELOPE DETECTION CIRCUIT
11
SYMBOL CLOCK EXTRACTION CIRCUIT
14
SPECTRUM ANALYSIS CIRCUIT
16
ENVELOPE FLUCTUATION DETERMINATION CIRCUIT
12
SYMBOL CLOCK DETERMINATION CIRCUIT
15
MODULATION TYPE DETERMINATION CIRCUIT
13
LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT
2 ANALOG MODULATION TYPE DISCRIMINATION CIRCUIT
CARRIER WAVE EXTRACTION CIRCUIT
21
SIDE BAND SPECTRUM DETECTION CIRCUIT
22
SIGNAL BAND DETECTION CIRCUIT
23
ENVELOPE DETECTION CIRCUIT
26
MODULATION TYPE DETERMINATION CIRCUIT
24
ENVELOPE FLUCTUATION DETERMINATION CIRCUIT
27
BACKTRACKING CIRCUIT
25
MODULATION TYPE DISCRIMINATION RESULT (AM / FM)
3
SYMBOL CLOCK EXTRACTION CIRCUIT
31
RE- SAMPLING CIRCUIT
32
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
33
MODULATION TYPE DETERMINATION CIRCUIT
34
MODULATION TYPE DISCRIMINATION RESULT
(16QAM,M-ary QAM)
ASSUMED CARRIER WAVE SYNCHRONIZATION PROCESSING CIRCUIT
35
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
36
MODULATION TYPE DETERMINATION CIRCUIT
37
BACKTRACKING CIRCUIT
38
MODULATION TYPE DISCRIMINATION RESULT
(BPSK / QPSK / π /4shiftQPSK / 8-PSK / M-aryPSK)
4 NON-LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT
FM DETECTION CIRCUIT
41
RE-SAMPLING CIRCUIT
42
SYMBOL CLOCK EXTRACTION CIRCUIT
45
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
43
MODULATION TYPE DETERMINATION CIRCUIT
44
MODULATION TYPE DETERMINATION RESULT (M-ary FSK)
MODULATION INDEX DETECTION CIRCUIT
46
MODULATION TYPE DETERMINATION CIRCUIT
47
INTER SYMBOL INTERFERENCE ANALYSIS CIRCUIT
48
SPECTRUM ANALYSIS CIRCUIT
49
MODULATION TYPE DETERMINATION CIRCUIT
50
BACKTRACKING CIRCUIT
51
MODULATION TYPE DISCRIMINATION RESULT (2-FSK)
MODULATION TYPE DISCRIMINATION RESULT (MSK / GMSK)

FIG. 5

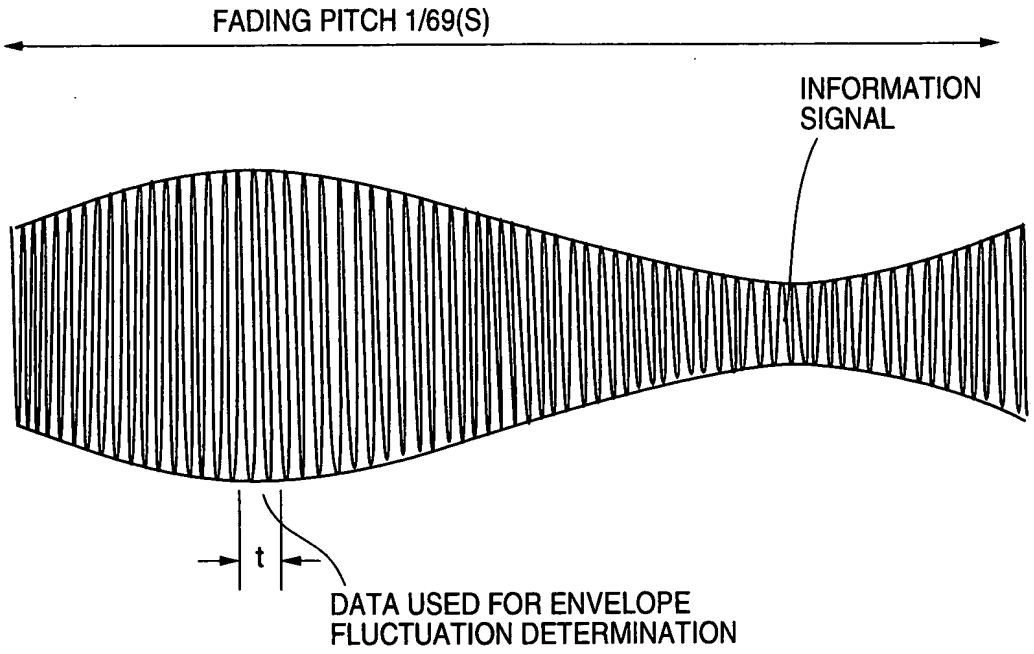

FADING PITCH 1/69(S)
INFORMATION SIGNAL
t
DATA USED FOR ENVELOPE FLUCTUATION DETERMINATION

FIG. 6

OBJECT / CHARACTERISTIC	ANALOG MODULATION TYPE	DIGITAL LINEAR MODULATION TYPE	DIGITAL NON-LINEAR MODULATION TYPE	REMARK
EXISTENCE/ NONEXISTENCE OF SYMBOL CLOCK	0	1	1	EXISTENCE:1 NON-EXISTENCE: 0
ENVELOPE FLUCTUATION	AM-1 FM-0	1	0	EXISTENCE:1 NON-EXISTENCE:0
SPECTRUM SHAPE	(AM) TWO SIDE BAND SPECTRUMS SYMMETRICAL ABOUT CARRIER WAVE SPECTRUM	BAND RESTRICTION TYPE SPECTRUM SPECTRUM SHARPLY ATTENUATES	SPECTRUM EXISTS OVER WIDE BAND SPECTRUM ATTENUATES ACCOMPANYING WITH DETUNING OF FREQUENCY	

FIG. 7

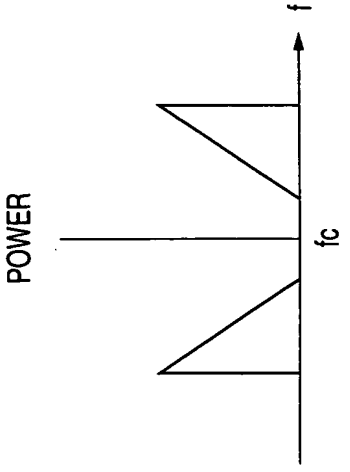


FIG. 8A

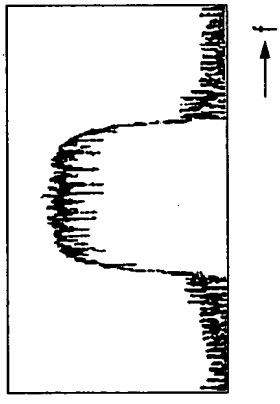


FIG. 8B

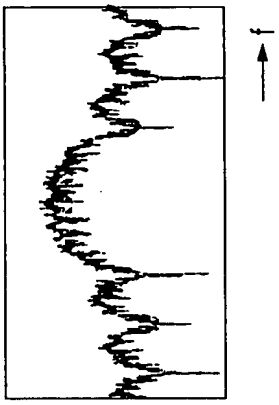


FIG. 8C

OBJECT / CHARACTERISTIC	AM	FM	REMARK
EXISTENCE / NON-EXISTENCE OF CARRIER WAVE SPECTRUM	1	——	EXISTENCE:1 NON-EXISTENCE:0
EXISTENCE / NON-EXISTENCE OF SYMMETRY OF SPECTRUM	1	0	EXISTENCE:1 NON-EXISTENCE:0
SIGNAL BAND WIDTH	0	1	EXCLUDING NARROW BAND FM, DIFFUSION SPECTRUM :1 NON- DIFFUSION SPECTRUM :0
ENVELOPE FLUCTUATION	1	0	EXISTENCE :1 NON- EXISTENCE :0

FIG. 9

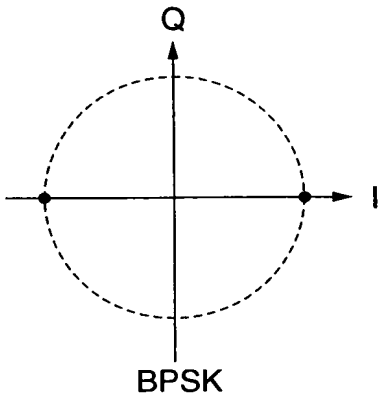


FIG. 10A

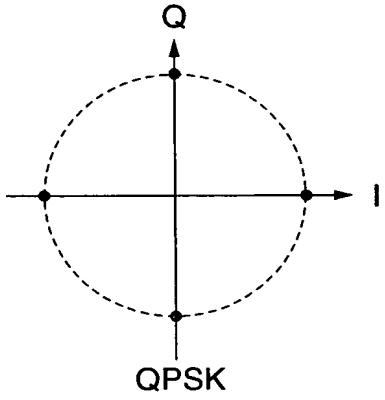


FIG. 10B

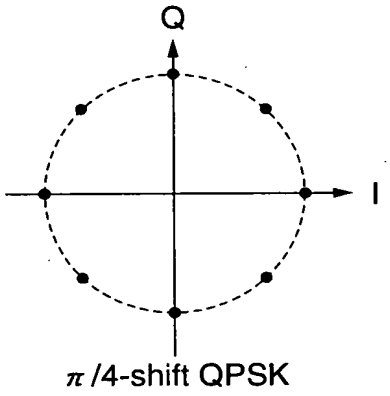


FIG. 10C

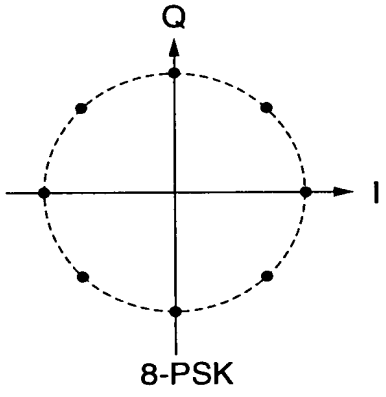


FIG. 10D

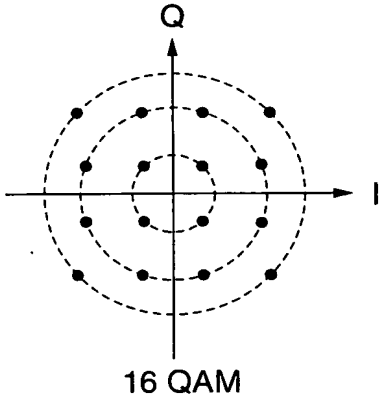
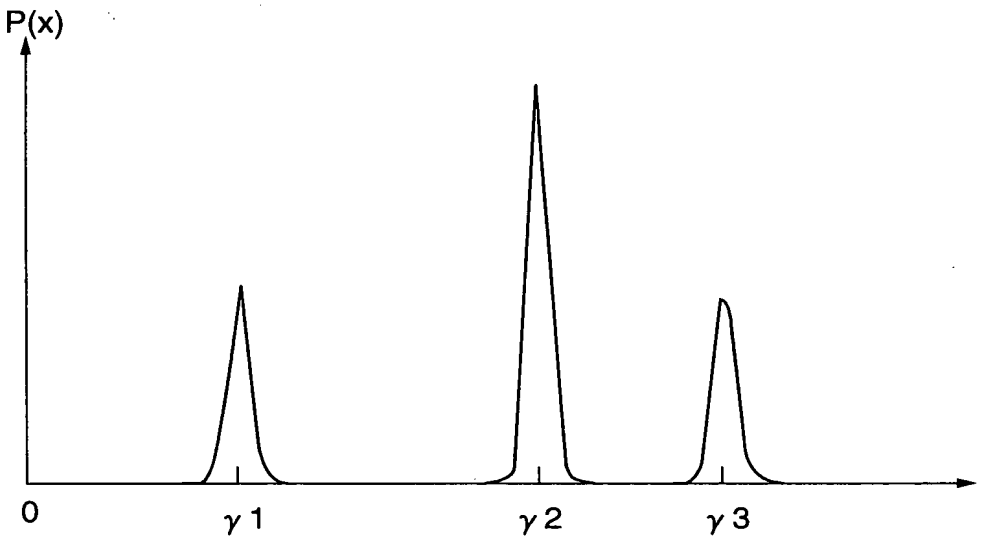


FIG. 10E

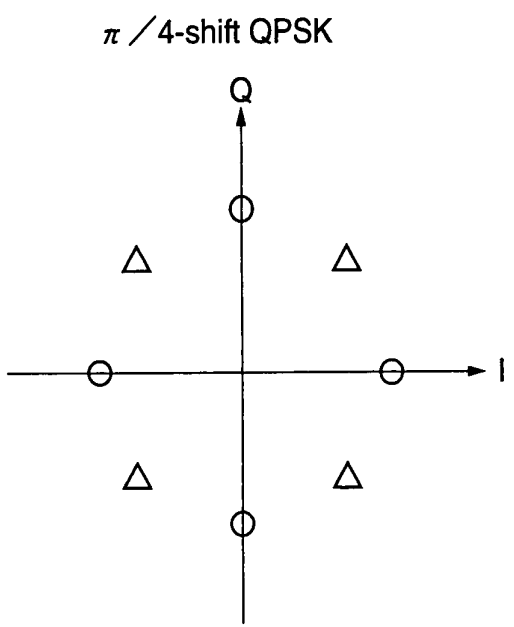


16QAM

FIG. 11A

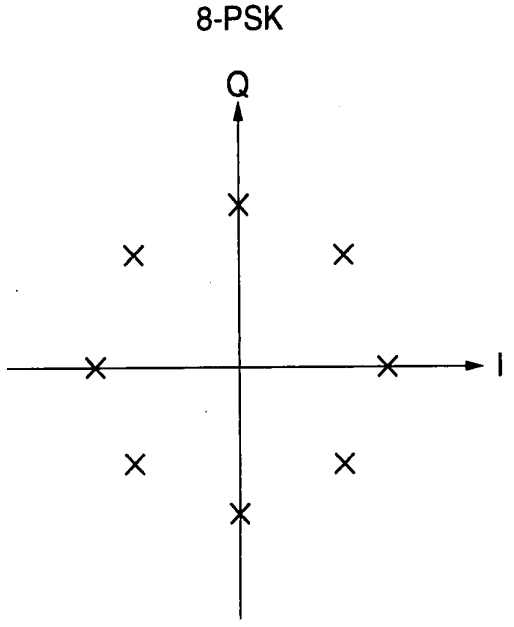
64QAM

FIG. 11B



○: SYMBOL CONVERGENCE POSITION OF (ODD NUMBER)-TH
△: SYMBOL CONVERGENCE POSITION OF (EVEN NUMBER)-TH

FIG. 12A



×: SYMBOL CONVERGENCE POSITION OF (ODD NUMBER)-TH
/(EVEN NUMBER)-TH

FIG. 12B

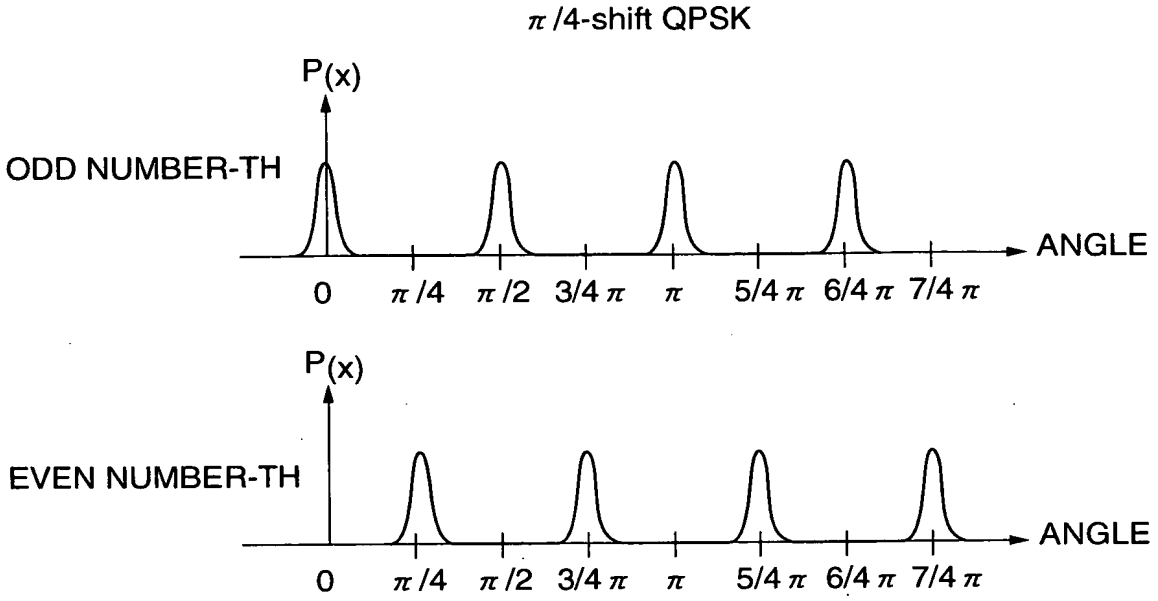


FIG. 13A

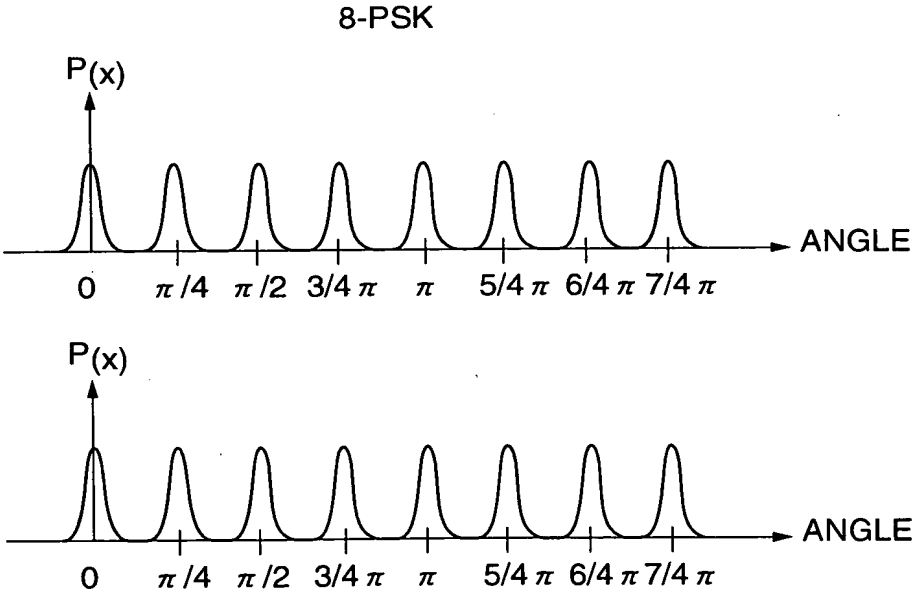


FIG. 13B

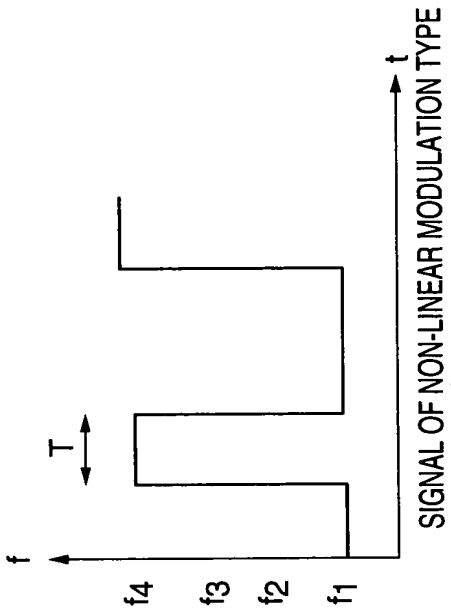


FIG. 14B

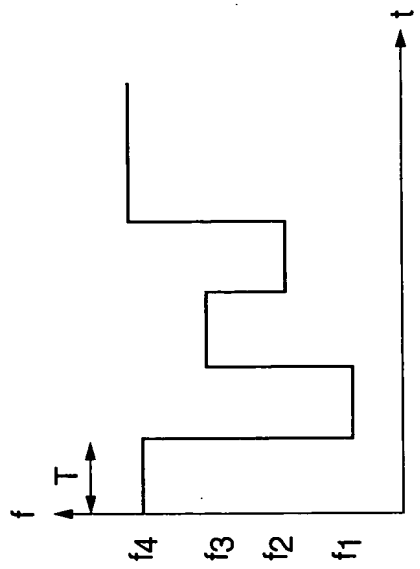


FIG. 14A

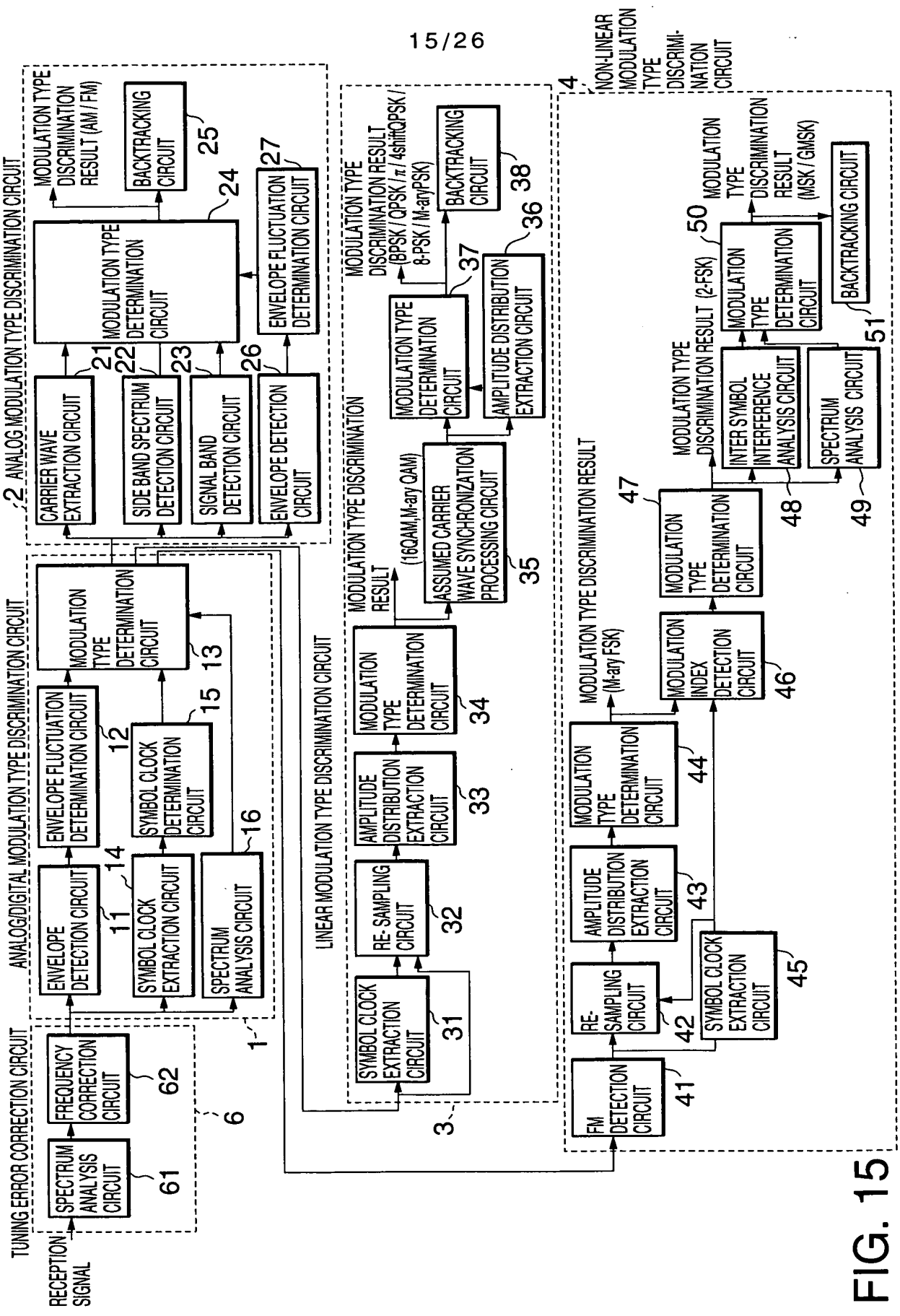

RECEPTION SIGNAL
TUNING ERROR CORRECTION CIRCUIT
SPECTRUM ANALYSIS CIRCUIT
61
FREQUENCY CORRECTION CIRCUIT
62
6
1
ANALOG/DIGITAL MODULATION TYPE DISCRIMINATION CIRCUIT
ENVELOPE DETECTION CIRCUIT
11
ENVELOPE FLUCTUATION DETERMINATION CIRCUIT
12
SYMBOL CLOCK EXTRACTION CIRCUIT
14
SYMBOL CLOCK DETERMINATION CIRCUIT
15
SPECTRUM ANALYSIS CIRCUIT
16
MODULATION TYPE DETERMINATION CIRCUIT
13
LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT
2 ANALOG MODULATION TYPE DISCRIMINATION CIRCUIT
CARRIER WAVE EXTRACTION CIRCUIT
21
SIDE BAND SPECTRUM DETECTION CIRCUIT
22
SIGNAL BAND DETECTION CIRCUIT
23
ENVELOPE DETECTION CIRCUIT
26
ENVELOPE FLUCTUATION DETERMINATION CIRCUIT
27
MODULATION TYPE DETERMINATION CIRCUIT
24
BACKTRACKING CIRCUIT
25
MODULATION TYPE DISCRIMINATION RESULT (AM / FM)
3
SYMBOL CLOCK EXTRACTION CIRCUIT
31
RE- SAMPLING CIRCUIT
32
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
33
MODULATION TYPE DETERMINATION CIRCUIT
34
MODULATION TYPE DISCRIMINATION RESULT
(16QAM, M-ary QAM)
ASSUMED CARRIER WAVE SYNCHRONIZATION PROCESSING CIRCUIT
35
MODULATION TYPE DETERMINATION CIRCUIT
37
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
36
BACKTRACKING CIRCUIT
38
MODULATION TYPE DISCRIMINATION RESULT
(BPSK / QPSK / π/4shiftQPSK / 8-PSK / M-aryPSK)
4
NON-LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT
FM DETECTION CIRCUIT
41
RE-SAMPLING CIRCUIT
42
SYMBOL CLOCK EXTRACTION CIRCUIT
45
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
43
MODULATION TYPE DETERMINATION CIRCUIT
44
MODULATION INDEX DETECTION CIRCUIT
46
MODULATION TYPE DETERMINATION CIRCUIT
47
MODULATION TYPE DISCRIMINATION RESULT
(M-ary FSK)
INTER SYMBOL INTERFERENCE ANALYSIS CIRCUIT
48
SPECTRUM ANALYSIS CIRCUIT
49
MODULATION TYPE DETERMINATION CIRCUIT
50
MODULATION TYPE DISCRIMINATION RESULT (2-FSK)
BACKTRACKING CIRCUIT
51
MODULATION TYPE DISCRIMINATION RESULT
(MSK / GMSK)

FIG. 15

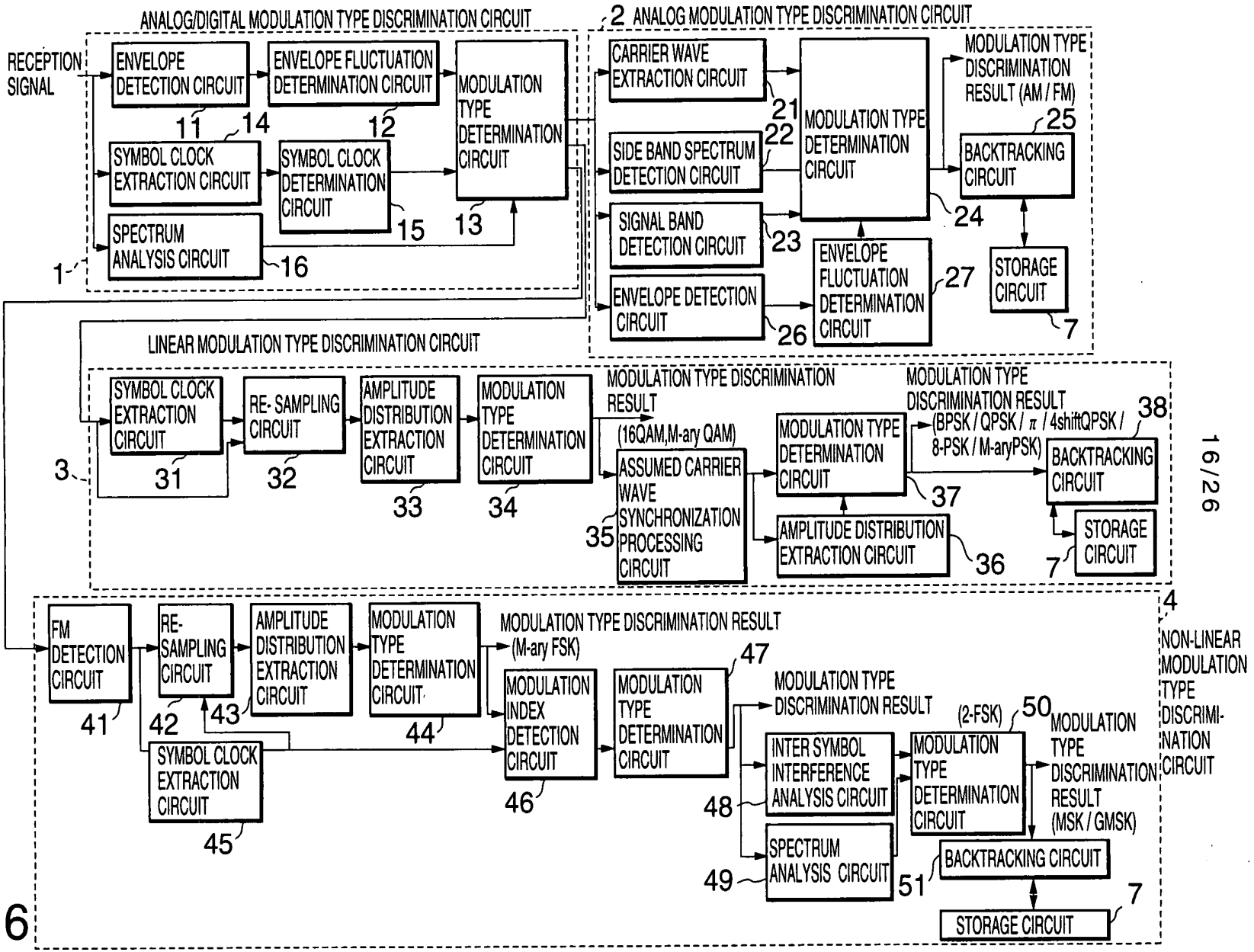

ANALOG/DIGITAL MODULATION TYPE DISCRIMINATION CIRCUIT
2 ANALOG MODULATION TYPE DISCRIMINATION CIRCUIT
RECEPTION SIGNAL
ENVELOPE DETECTION CIRCUIT
ENVELOPE FLUCTUATION DETERMINATION CIRCUIT
MODULATION TYPE DETERMINATION CIRCUIT
SYMBOL CLOCK EXTRACTION CIRCUIT
SYMBOL CLOCK DETERMINATION CIRCUIT
SPECTRUM ANALYSIS CIRCUIT
CARRIER WAVE EXTRACTION CIRCUIT
SIDE BAND SPECTRUM DETECTION CIRCUIT
SIGNAL BAND DETECTION CIRCUIT
ENVELOPE DETECTION CIRCUIT
MODULATION TYPE DETERMINATION CIRCUIT
MODULATION TYPE DISCRIMINATION RESULT (AM / FM)
BACKTRACKING CIRCUIT
ENVELOPE FLUCTUATION DETERMINATION CIRCUIT
STORAGE CIRCUIT
LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT
SYMBOL CLOCK EXTRACTION CIRCUIT
RE- SAMPLING CIRCUIT
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
MODULATION TYPE DETERMINATION CIRCUIT
MODULATION TYPE DISCRIMINATION RESULT
(16QAM,M-ary QAM)
ASSUMED CARRIER WAVE SYNCHRONIZATION PROCESSING CIRCUIT
MODULATION TYPE DETERMINATION CIRCUIT
MODULATION TYPE DISCRIMINATION RESULT
(BPSK / QPSK / π / 4shiftQPSK / 8-PSK / M-aryPSK)
BACKTRACKING CIRCUIT
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
STORAGE CIRCUIT
FM DETECTION CIRCUIT
RE-SAMPLING CIRCUIT
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
MODULATION TYPE DETERMINATION CIRCUIT
MODULATION TYPE DISCRIMINATION RESULT (M-ary FSK)
SYMBOL CLOCK EXTRACTION CIRCUIT
MODULATION INDEX DETECTION CIRCUIT
MODULATION TYPE DETERMINATION CIRCUIT
MODULATION TYPE DISCRIMINATION RESULT
INTER SYMBOL INTERFERENCE ANALYSIS CIRCUIT
SPECTRUM ANALYSIS CIRCUIT
(2-FSK)
MODULATION TYPE DETERMINATION CIRCUIT
MODULATION TYPE DISCRIMINATION RESULT (MSK / GMSK)
BACKTRACKING CIRCUIT
STORAGE CIRCUIT
NON-LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT
1
3
4
7
11
12
13
14
15
16
21
22
23
24
25
26
27
31
32
33
34
35
36
37
38
41
42
43
44
45
46
47
48
49
50
51

FIG. 16

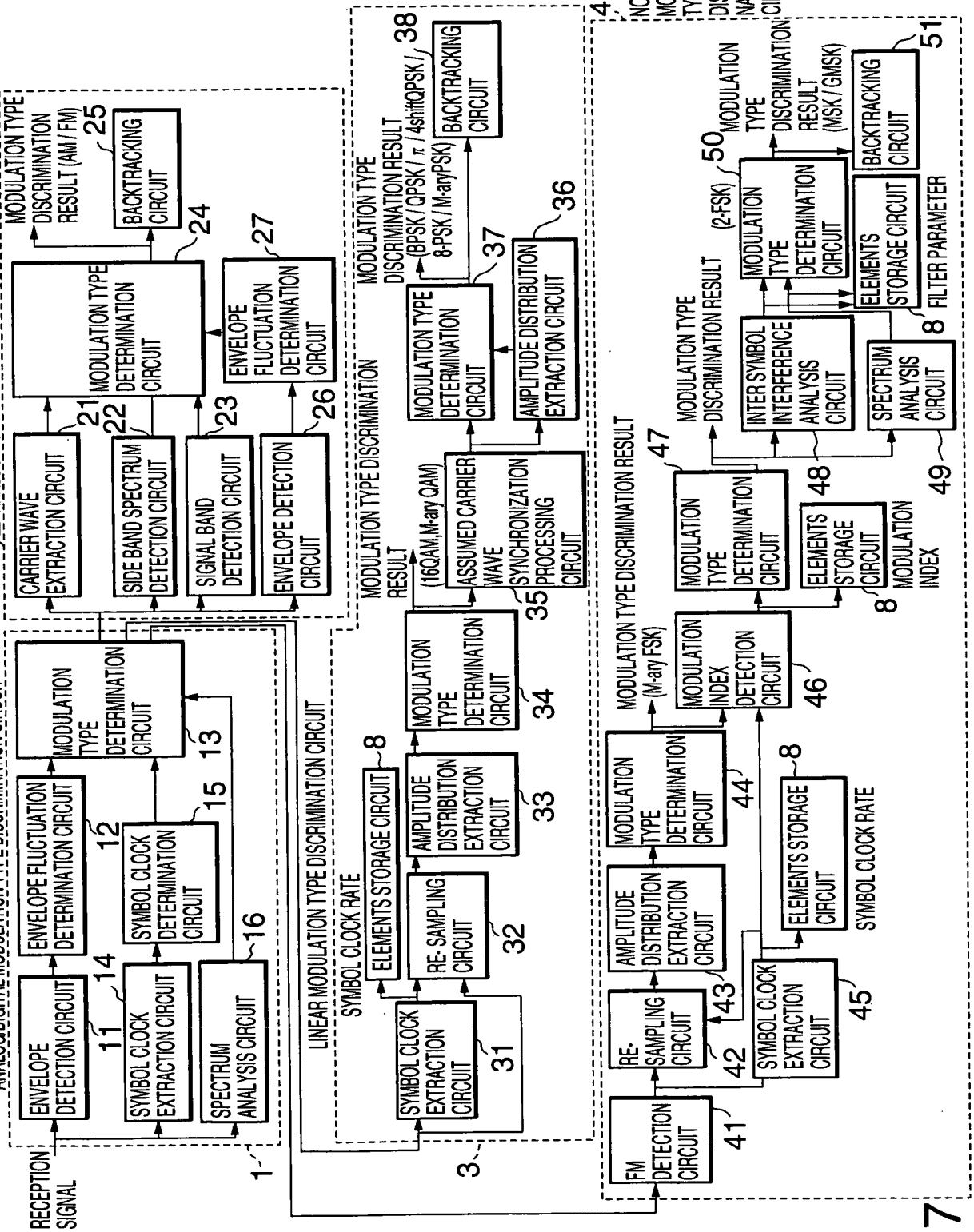

RECEPTION SIGNAL
1
ANALOG/DIGITAL MODULATION TYPE DISCRIMINATION CIRCUIT
ENVELOPE DETECTION CIRCUIT
11
ENVELOPE FLUCTUATION DETERMINATION CIRCUIT
12
SYMBOL CLOCK EXTRACTION CIRCUIT
14
SYMBOL CLOCK DETERMINATION CIRCUIT
15
SPECTRUM ANALYSIS CIRCUIT
16
MODULATION TYPE DETERMINATION CIRCUIT
13
LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT
3
SYMBOL CLOCK RATE
ELEMENTS STORAGE CIRCUIT
8
SYMBOL CLOCK EXTRACTION CIRCUIT
31
RE-SAMPLING CIRCUIT
32
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
33
MODULATION TYPE DETERMINATION CIRCUIT
34
2 ANALOG MODULATION TYPE DISCRIMINATION CIRCUIT
CARRIER WAVE EXTRACTION CIRCUIT
21
SIDE BAND SPECTRUM DETECTION CIRCUIT
22
SIGNAL BAND DETECTION CIRCUIT
23
ENVELOPE DETECTION CIRCUIT
26
MODULATION TYPE DETERMINATION CIRCUIT
24
ENVELOPE FLUCTUATION DETERMINATION CIRCUIT
27
MODULATION TYPE DISCRIMINATION RESULT (AM / FM)
25
BACKTRACKING CIRCUIT
MODULATION TYPE DISCRIMINATION RESULT
(16QAM,M-ary QAM)
ASSUMED CARRIER WAVE SYNCHRONIZATION PROCESSING CIRCUIT
35
MODULATION TYPE DETERMINATION CIRCUIT
37
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
36
MODULATION TYPE DISCRIMINATION RESULT
(BPSK / QPSK / π / 4shiftQPSK / 8-PSK / M-aryPSK)
BACKTRACKING CIRCUIT
38
4 NON-LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT
FM DETECTION CIRCUIT
41
RE-SAMPLING CIRCUIT
42
SYMBOL CLOCK EXTRACTION CIRCUIT
43
45
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
MODULATION TYPE DETERMINATION CIRCUIT
44
ELEMENTS STORAGE CIRCUIT
8
SYMBOL CLOCK RATE
MODULATION TYPE DISCRIMINATION RESULT
(M-ary FSK)
MODULATION INDEX DETECTION CIRCUIT
46
MODULATION TYPE DETERMINATION CIRCUIT
47
ELEMENTS STORAGE CIRCUIT
48
8
MODULATION INDEX
MODULATION TYPE DISCRIMINATION RESULT
INTER SYMBOL INTERFERENCE ANALYSIS CIRCUIT
SPECTRUM ANALYSIS CIRCUIT
49
8
FILTER PARAMETER
(2-FSK)
MODULATION TYPE DETERMINATION CIRCUIT
50
ELEMENTS STORAGE CIRCUIT
MODULATION TYPE DISCRIMINATION RESULT
(MSK / GMSK)
BACKTRACKING CIRCUIT
51

FIG. 17

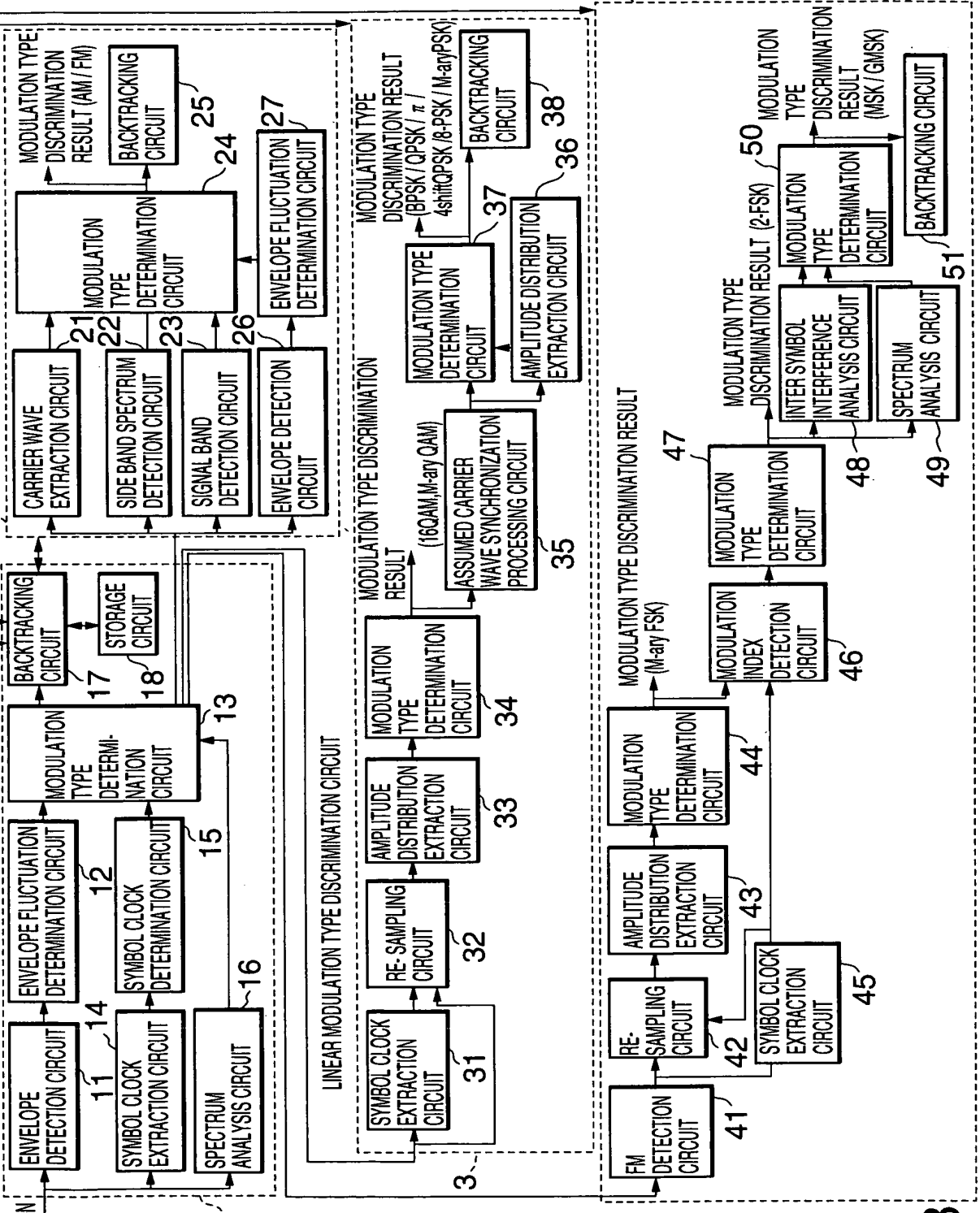

RECEPTION SIGNAL
1
ANALOG/DIGITAL MODULATION TYPE DISCRIMINATION CIRCUIT
ENVELOPE DETECTION CIRCUIT
11
SYMBOL CLOCK EXTRACTION CIRCUIT
14
SPECTRUM ANALYSIS CIRCUIT
16
ENVELOPE FLUCTUATION DETERMINATION CIRCUIT
12
SYMBOL CLOCK DETERMINATION CIRCUIT
15
MODULATION TYPE DETERMINATION CIRCUIT
13
BACKTRACKING CIRCUIT
17
STORAGE CIRCUIT
18
2 ANALOG MODULATION TYPE DISCRIMINATION CIRCUIT
CARRIER WAVE EXTRACTION CIRCUIT
21
SIDE BAND SPECTRUM DETECTION CIRCUIT
22
SIGNAL BAND DETECTION CIRCUIT
23
ENVELOPE DETECTION CIRCUIT
26
MODULATION TYPE DETERMINATION CIRCUIT
24
ENVELOPE FLUCTUATION DETERMINATION CIRCUIT
27
MODULATION TYPE DISCRIMINATION RESULT (AM / FM)
BACKTRACKING CIRCUIT
25
LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT
3
SYMBOL CLOCK EXTRACTION CIRCUIT
31
RE-SAMPLING CIRCUIT
32
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
33
MODULATION TYPE DETERMINATION CIRCUIT
34
MODULATION TYPE DISCRIMINATION RESULT
(16QAM,M-ary QAM)
ASSUMED CARRIER WAVE SYNCHRONIZATION PROCESSING CIRCUIT
35
MODULATION TYPE DETERMINATION CIRCUIT
37
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
36
MODULATION TYPE DISCRIMINATION RESULT
(BPSK / QPSK / π / 4shiftQPSK /8-PSK / M-aryPSK)
BACKTRACKING CIRCUIT
38
4 NON-LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT
MODULATION TYPE DISCRIMINATION RESULT
(M-ary FSK)
FM DETECTION CIRCUIT
41
RE-SAMPLING CIRCUIT
42
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
43
MODULATION TYPE DETERMINATION CIRCUIT
44
SYMBOL CLOCK EXTRACTION CIRCUIT
45
MODULATION INDEX DETECTION CIRCUIT
46
MODULATION TYPE DETERMINATION CIRCUIT
47
MODULATION TYPE DISCRIMINATION RESULT (2-FSK)
INTER SYMBOL INTERFERENCE ANALYSIS CIRCUIT
48
SPECTRUM ANALYSIS CIRCUIT
49
MODULATION TYPE DETERMINATION CIRCUIT
50
MODULATION TYPE DISCRIMINATION RESULT (MSK / GMSK)
BACKTRACKING CIRCUIT
51

FIG. 18

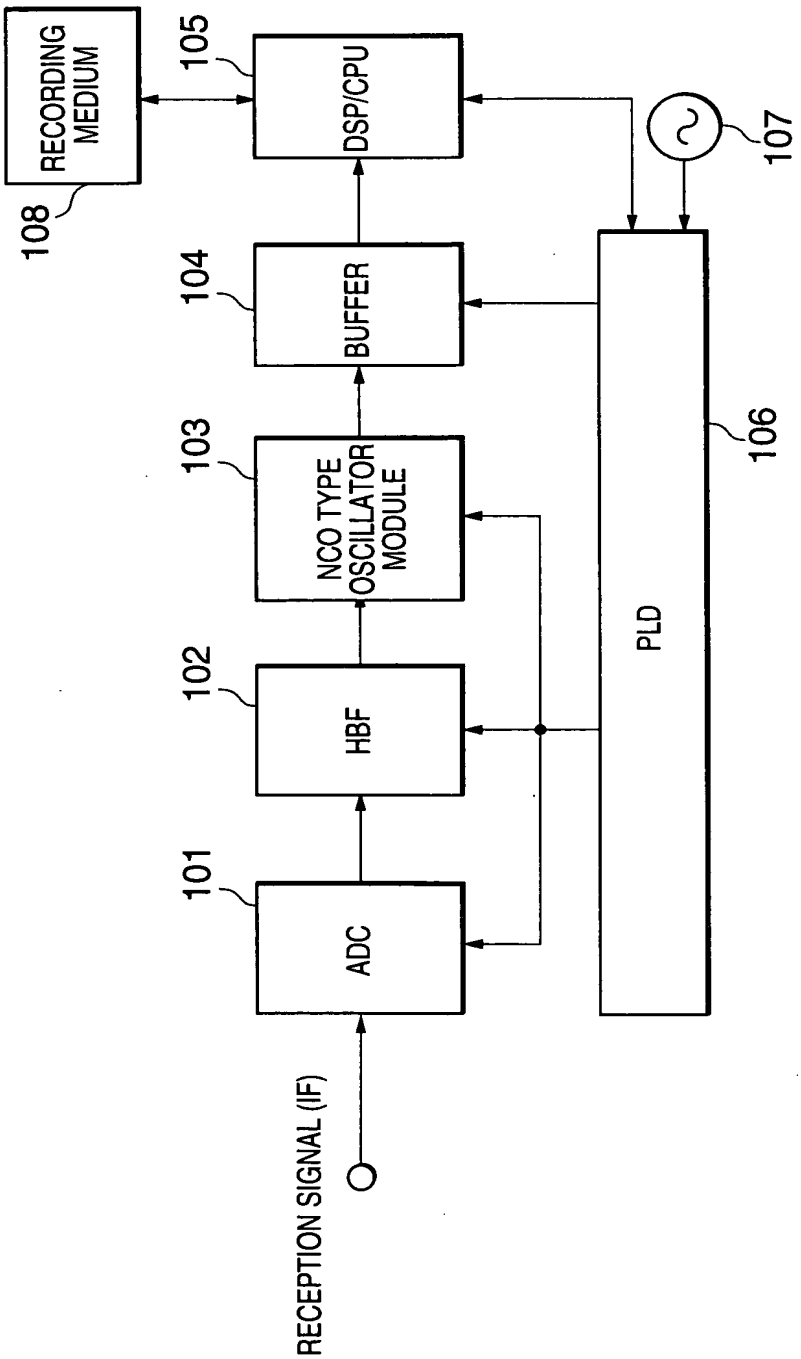

RECEPTION SIGNAL (IF)
ADC
101
HBF
102
NCO TYPE OSCILLATOR MODULE
103
BUFFER
104
DSP/CPU
105
PLD
106
107
RECORDING MEDIUM
108

FIG. 19

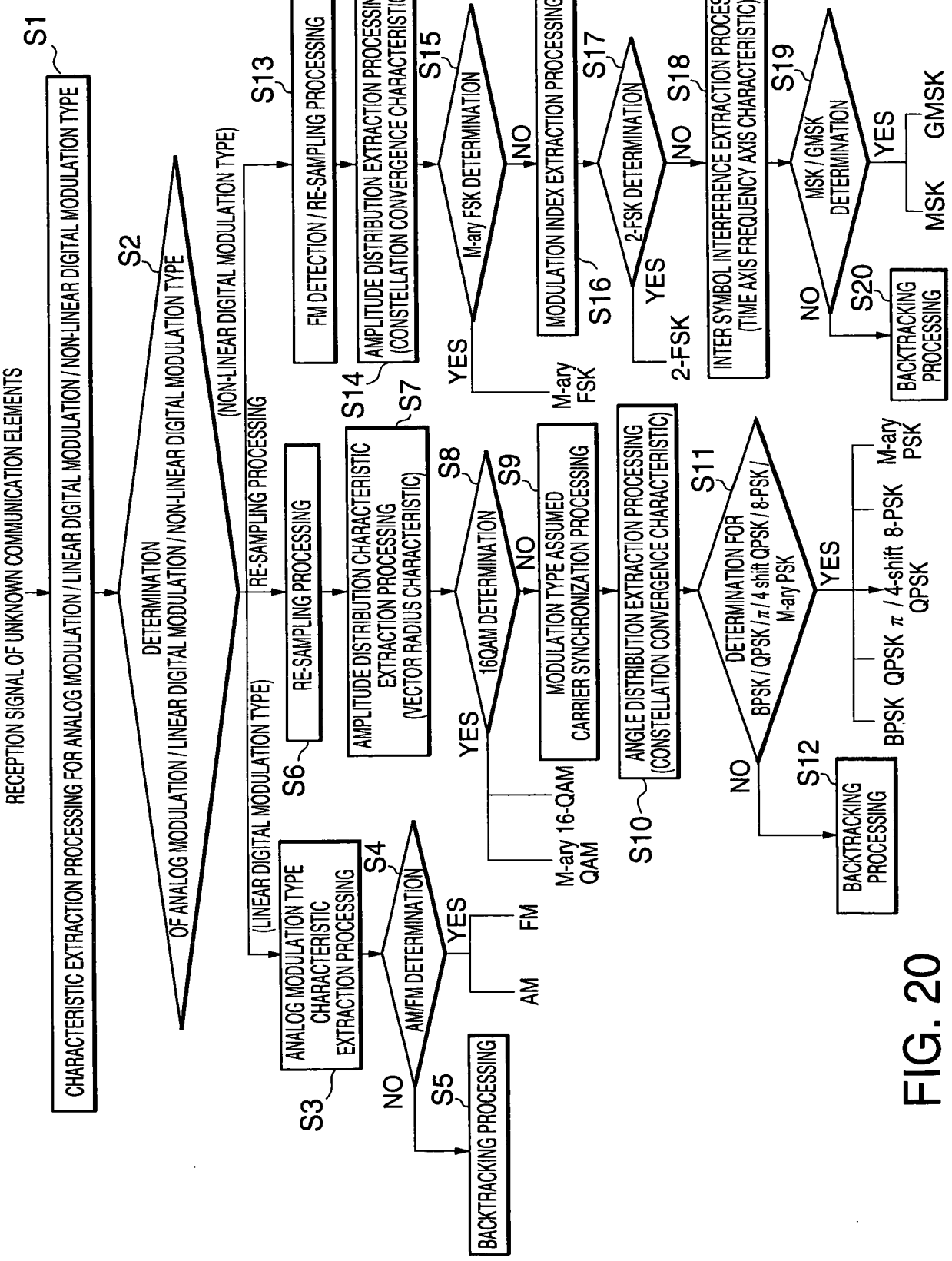

RECEPTION SIGNAL OF UNKNOWN COMMUNICATION ELEMENTS
S1
CHARACTERISTIC EXTRACTION PROCESSING FOR ANALOG MODULATION / LINEAR DIGITAL MODULATION / NON-LINEAR DIGITAL MODULATION TYPE
S2
DETERMINATION OF ANALOG MODULATION / LINEAR DIGITAL MODULATION / NON-LINEAR DIGITAL MODULATION TYPE
(LINEAR DIGITAL MODULATION TYPE)
(NON-LINEAR DIGITAL MODULATION TYPE)
ANALOG MODULATION TYPE CHARACTERISTIC EXTRACTION PROCESSING
S3
S4
AM/FM DETERMINATION
NO
YES
AM
FM
S5
BACKTRACKING PROCESSING
RE-SAMPLING PROCESSING
S6
RE-SAMPLING PROCESSING
S13
FM DETECTION / RE-SAMPLING PROCESSING
AMPLITUDE DISTRIBUTION CHARACTERISTIC EXTRACTION PROCESSING (VECTOR RADIUS CHARACTERISTIC)
S7
AMPLITUDE DISTRIBUTION EXTRACTION PROCESSING (CONSTELLATION CONVERGENCE CHARACTERISTIC)
S14
S8
16QAM DETERMINATION
YES
NO
M-ary 16-QAM
QAM
S9
MODULATION TYPE ASSUMED CARRIER SYNCHRONIZATION PROCESSING
S15
M-ary FSK DETERMINATION
YES
NO
M-ary FSK
MODULATION INDEX EXTRACTION PROCESSING
S16
S17
2-FSK DETERMINATION
YES
NO
2-FSK
S10
ANGLE DISTRIBUTION EXTRACTION PROCESSING (CONSTELLATION CONVERGENCE CHARACTERISTIC)
S11
DETERMINATION FOR BPSK / QPSK / π/4 shift QPSK / 8-PSK / M-ary PSK
NO
YES
S12
BACKTRACKING PROCESSING
BPSK
QPSK
π/4-shift QPSK
8-PSK
M-ary PSK
S18
INTER SYMBOL INTERFERENCE EXTRACTION PROCESSING (TIME AXIS FREQUENCY AXIS CHARACTERISTIC)
S19
MSK / GMSK DETERMINATION
YES
NO
MSK
GMSK
S20
BACKTRACKING PROCESSING

FIG. 20

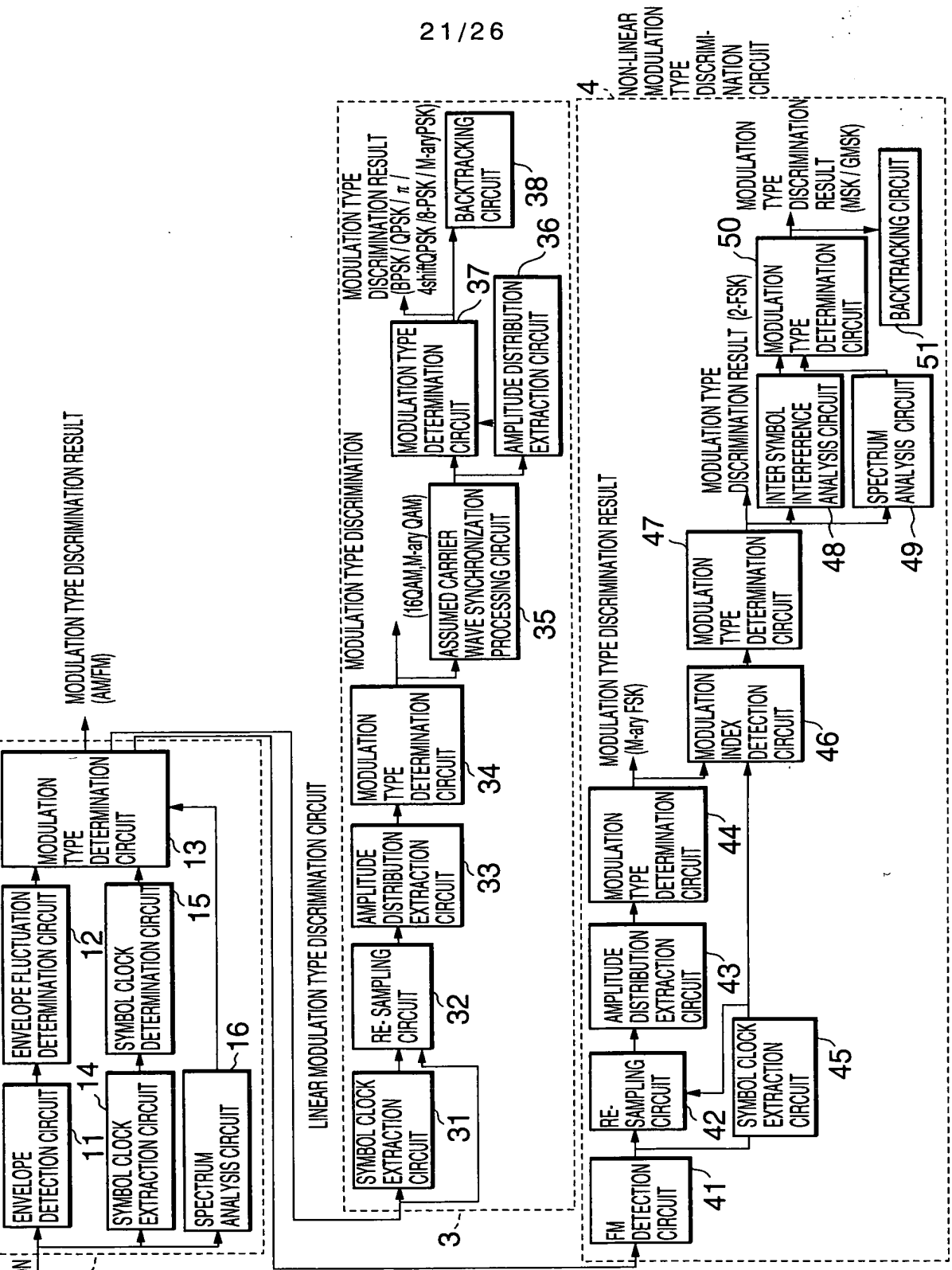

RECEPTION SIGNAL
1
ANALOG/DIGITAL MODULATION TYPE DISCRIMINATION CIRCUIT
ENVELOPE DETECTION CIRCUIT
11
ENVELOPE FLUCTUATION DETERMINATION CIRCUIT
12
SYMBOL CLOCK EXTRACTION CIRCUIT
14
SYMBOL CLOCK DETERMINATION CIRCUIT
15
SPECTRUM ANALYSIS CIRCUIT
16
MODULATION TYPE DETERMINATION CIRCUIT
13
MODULATION TYPE DISCRIMINATION RESULT (AM/FM)
LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT
3
SYMBOL CLOCK EXTRACTION CIRCUIT
31
RE-SAMPLING CIRCUIT
32
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
33
MODULATION TYPE DETERMINATION CIRCUIT
34
MODULATION TYPE DISCRIMINATION
(16QAM,M-ary QAM)
ASSUMED CARRIER WAVE SYNCHRONIZATION PROCESSING CIRCUIT
35
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
36
MODULATION TYPE DETERMINATION CIRCUIT
37
BACKTRACKING CIRCUIT
38
MODULATION TYPE DISCRIMINATION RESULT (BPSK / QPSK / π/4shiftQPSK /8-PSK / M-aryPSK)
4
NON-LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT
FM DETECTION CIRCUIT
41
RE-SAMPLING CIRCUIT
42
SYMBOL CLOCK EXTRACTION CIRCUIT
45
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
43
MODULATION TYPE DETERMINATION CIRCUIT
44
MODULATION TYPE DISCRIMINATION RESULT
(M-ary FSK)
MODULATION INDEX DETECTION CIRCUIT
46
MODULATION TYPE DETERMINATION CIRCUIT
47
INTER SYMBOL INTERFERENCE ANALYSIS CIRCUIT
48
SPECTRUM ANALYSIS CIRCUIT
49
MODULATION TYPE DETERMINATION CIRCUIT
50
BACKTRACKING CIRCUIT
51
MODULATION TYPE DISCRIMINATION RESULT (2-FSK)
MODULATION TYPE DISCRIMINATION RESULT (MSK / GMSK)

FIG. 21

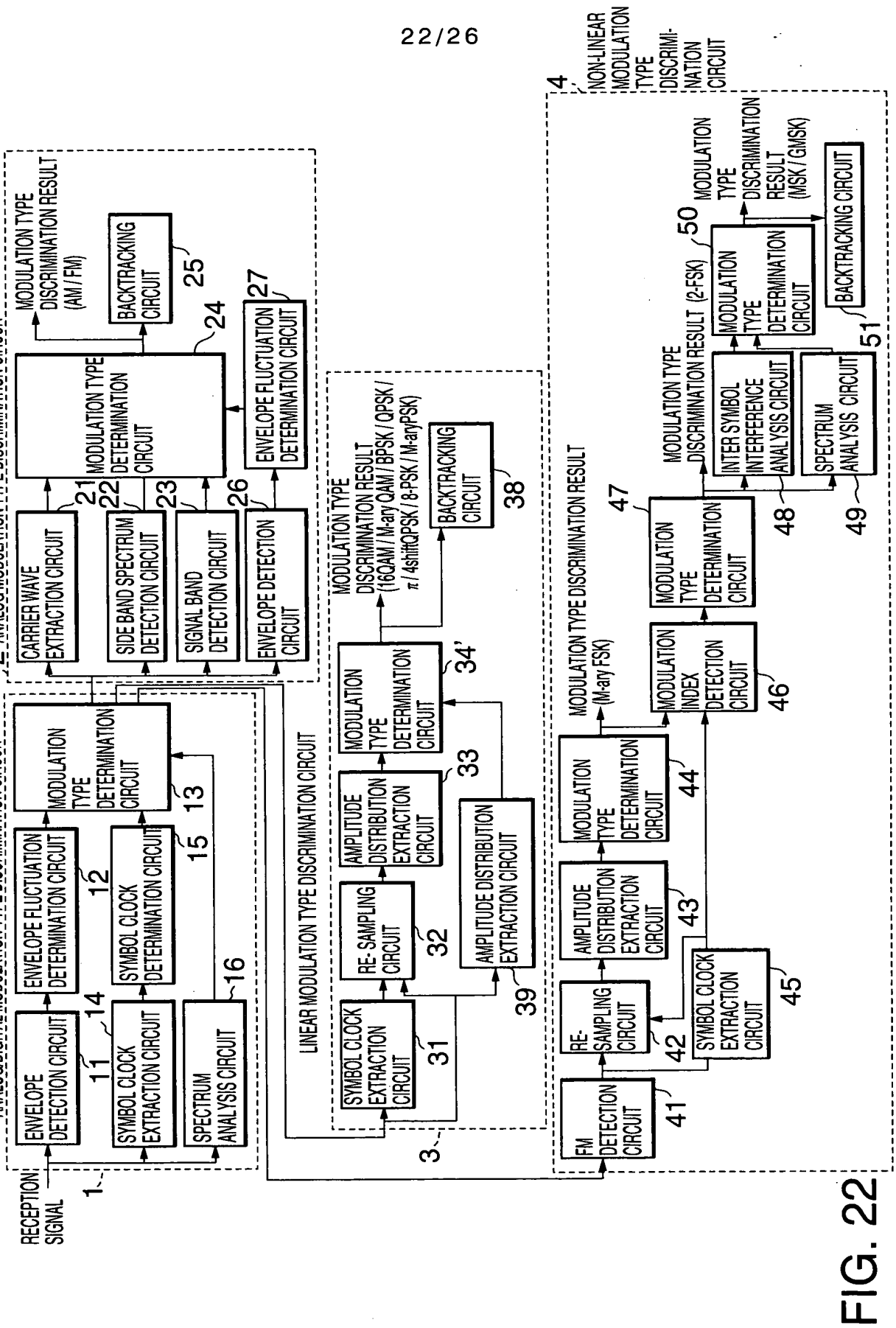

RECEPTION SIGNAL
1
ANALOG/DIGITAL MODULATION TYPE DISCRIMINATION CIRCUIT
ENVELOPE DETECTION CIRCUIT
11
SYMBOL CLOCK EXTRACTION CIRCUIT
14
SPECTRUM ANALYSIS CIRCUIT
16
ENVELOPE FLUCTUATION DETERMINATION CIRCUIT
12
SYMBOL CLOCK DETERMINATION CIRCUIT
15
MODULATION TYPE DETERMINATION CIRCUIT
13
LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT
2 ANALOG MODULATION TYPE DISCRIMINATION CIRCUIT
CARRIER WAVE EXTRACTION CIRCUIT
21
SIDE BAND SPECTRUM DETECTION CIRCUIT
22
SIGNAL BAND DETECTION CIRCUIT
23
ENVELOPE DETECTION CIRCUIT
26
MODULATION TYPE DETERMINATION CIRCUIT
24
ENVELOPE FLUCTUATION DETERMINATION CIRCUIT
27
BACKTRACKING CIRCUIT
25
MODULATION TYPE DISCRIMINATION RESULT (AM / FM)
3
SYMBOL CLOCK EXTRACTION CIRCUIT
31
RE- SAMPLING CIRCUIT
32
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
39
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
33
MODULATION TYPE DETERMINATION CIRCUIT
34'
MODULATION TYPE DISCRIMINATION RESULT (16QAM / M-ary QAM / BPSK / QPSK / π / 4shiftQPSK / 8-PSK / M-aryPSK)
BACKTRACKING CIRCUIT
38
4 NON-LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT
FM DETECTION CIRCUIT
41
RE-SAMPLING CIRCUIT
42
SYMBOL CLOCK EXTRACTION CIRCUIT
45
AMPLITUDE DISTRIBUTION EXTRACTION CIRCUIT
43
MODULATION TYPE DETERMINATION CIRCUIT
44
MODULATION TYPE DISCRIMINATION RESULT (M-ary FSK)
47
MODULATION INDEX DETECTION CIRCUIT
46
MODULATION TYPE DETERMINATION CIRCUIT
INTER SYMBOL INTERFERENCE ANALYSIS CIRCUIT
48
SPECTRUM ANALYSIS CIRCUIT
49
MODULATION TYPE DISCRIMINATION RESULT (2-FSK)
50
MODULATION TYPE DETERMINATION CIRCUIT
51
MODULATION TYPE DISCRIMINATION RESULT (MSK / GMSK)
BACKTRACKING CIRCUIT

FIG. 22

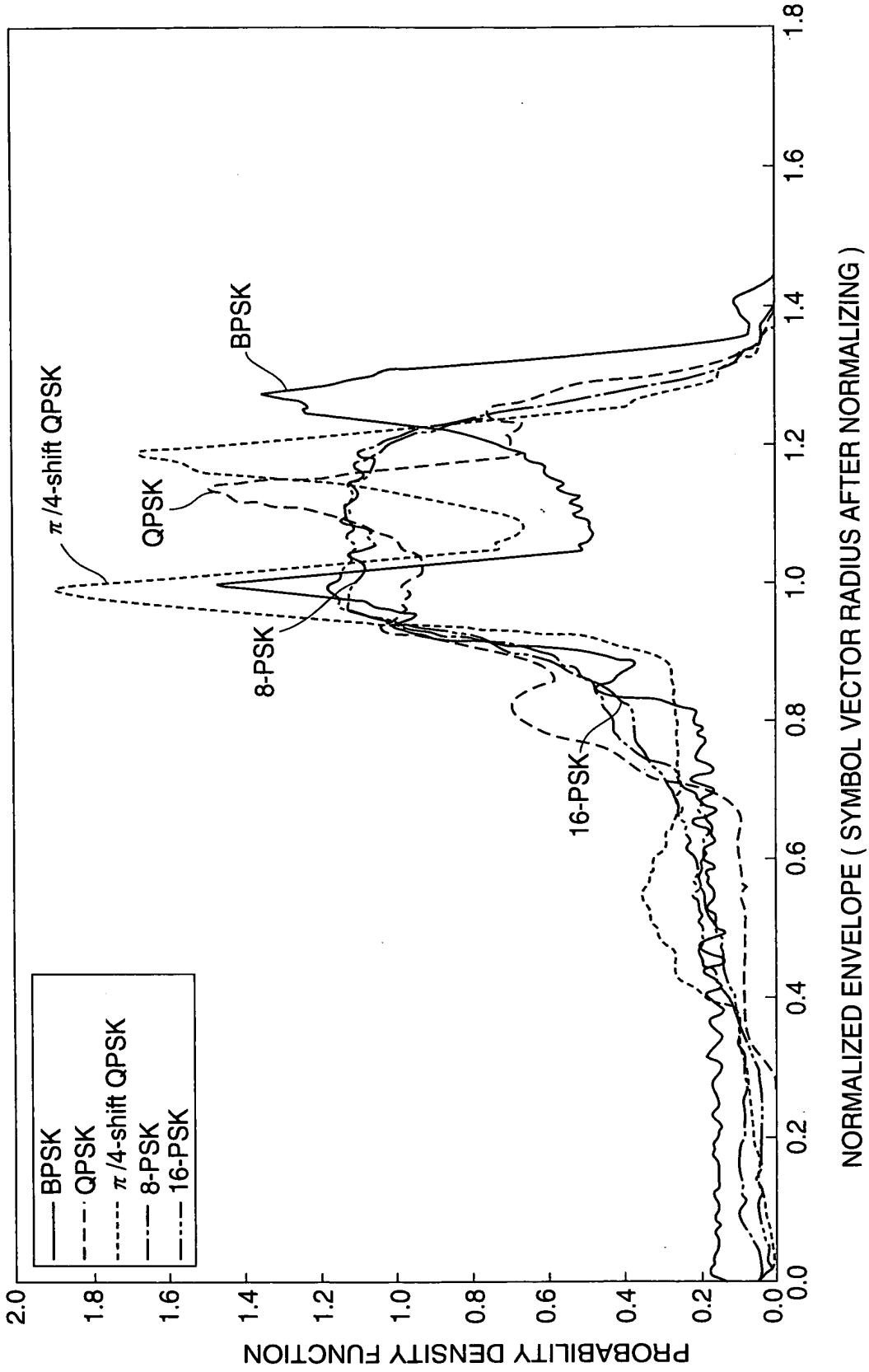

BPSK
QPSK
π/4-shift QPSK
8-PSK
16-PSK
π/4-shift QPSK
QPSK
BPSK
8-PSK
16-PSK
PROBABILITY DENSITY FUNCTION
NORMALIZED ENVELOPE (SYMBOL VECTOR RADIUS AFTER NORMALIZING)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0

FIG. 23

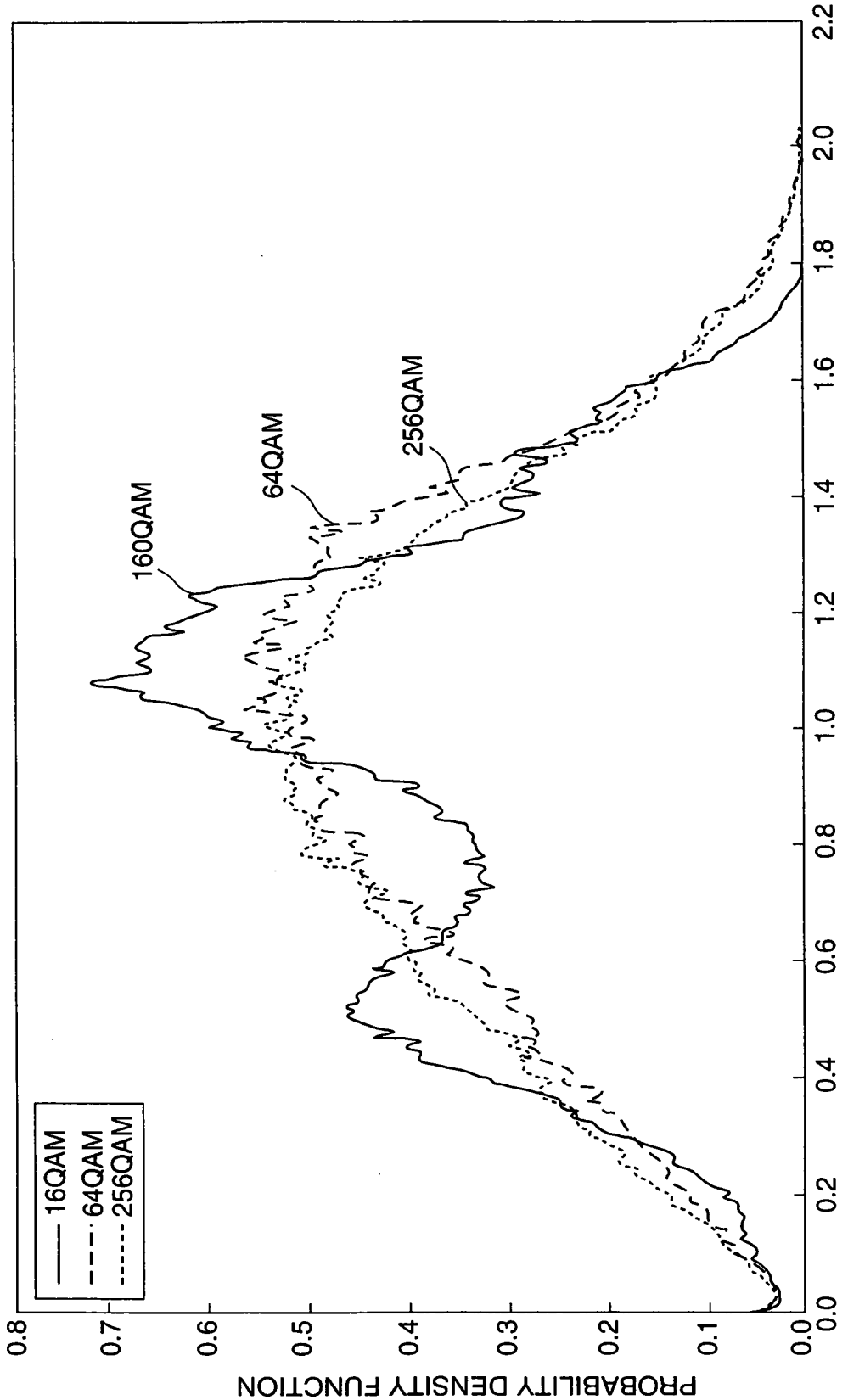

16QAM
64QAM
256QAM
160QAM
64QAM
256QAM
PROBABILITY DENSITY FUNCTION
NORMALIZED ENVELOPE (SYMBOL VECTOR RADIUS AFTER NORMALIZING)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2

FIG. 24

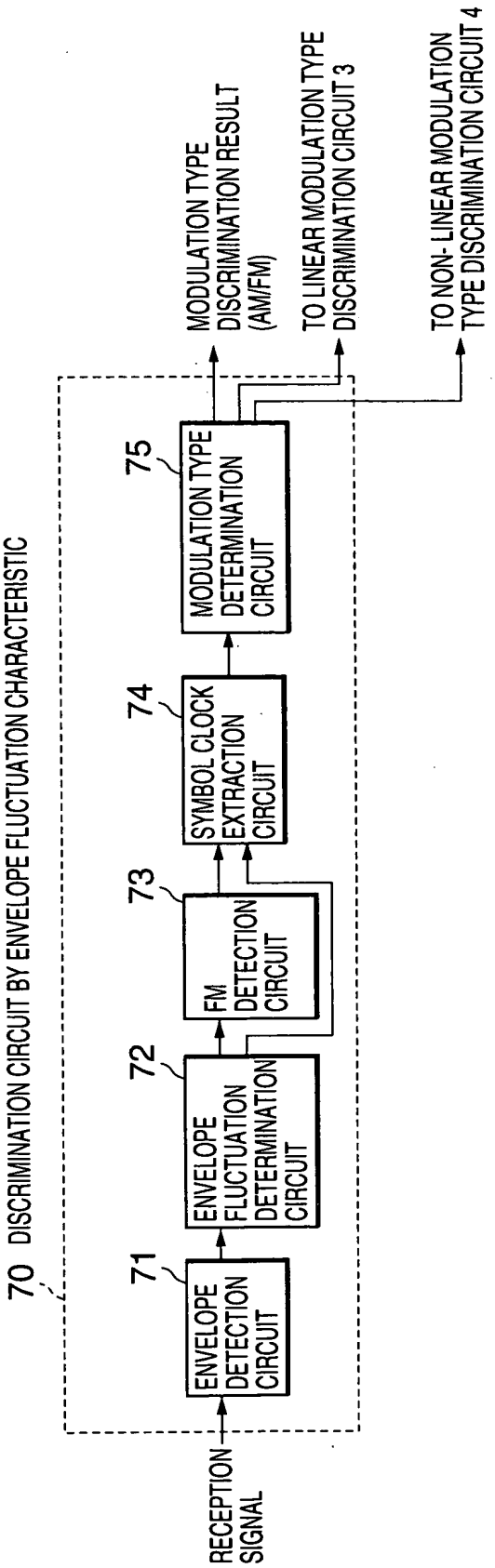

RECEPTION SIGNAL
70 DISCRIMINATION CIRCUIT BY ENVELOPE FLUCTUATION CHARACTERISTIC
71
ENVELOPE DETECTION CIRCUIT
72
ENVELOPE FLUCTUATION DETERMINATION CIRCUIT
73
FM DETECTION CIRCUIT
74
SYMBOL CLOCK EXTRACTION CIRCUIT
75
MODULATION TYPE DETERMINATION CIRCUIT
MODULATION TYPE DISCRIMINATION RESULT (AM/FM)
TO LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT 3
TO NON-LINEAR MODULATION TYPE DISCRIMINATION CIRCUIT 4

FIG. 25

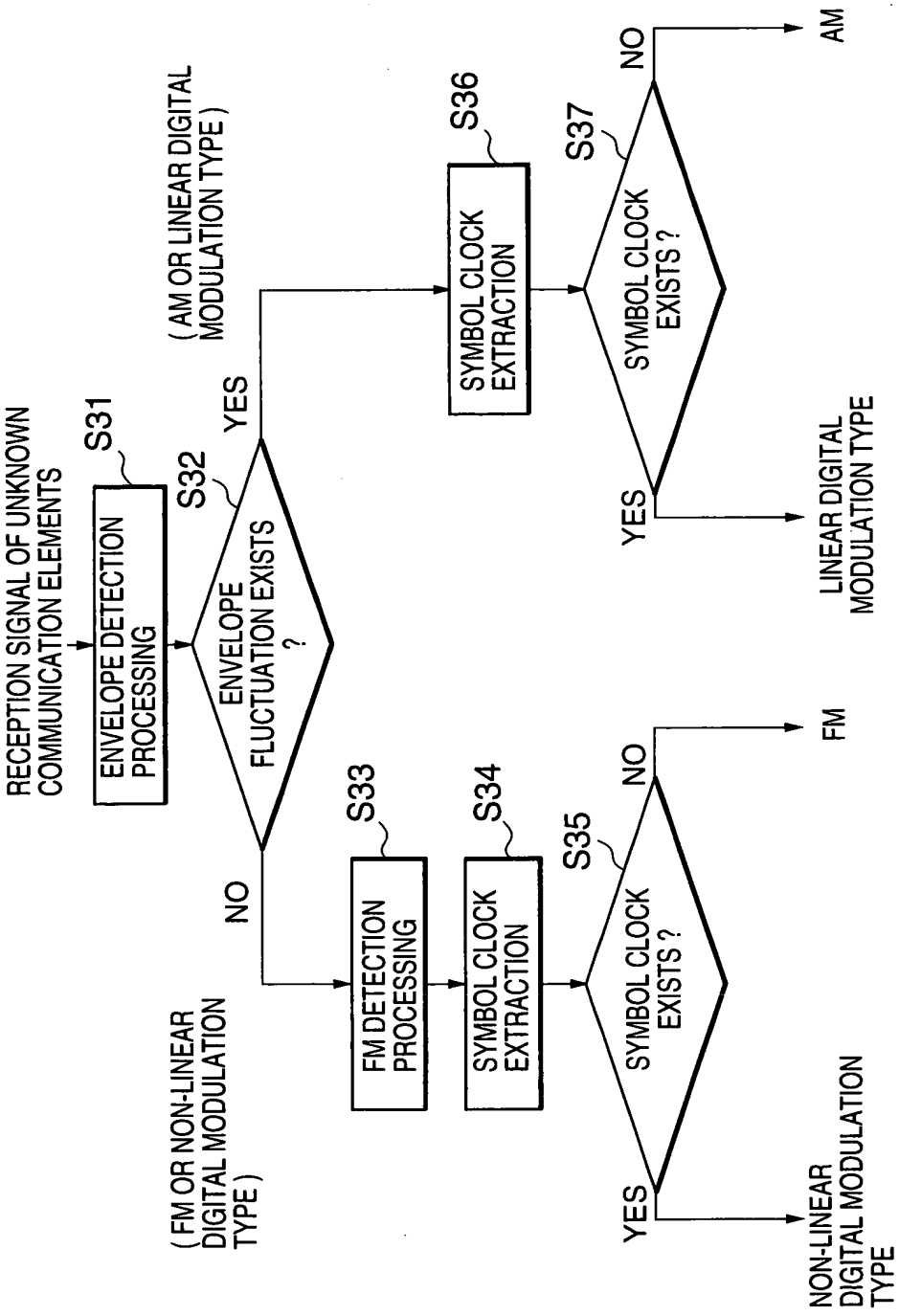

RECEPTION SIGNAL OF UNKNOWN COMMUNICATION ELEMENTS
S31
ENVELOPE DETECTION PROCESSING
S32
ENVELOPE FLUCTUATION EXISTS ?
YES
(AM OR LINEAR DIGITAL MODULATION TYPE)
S36
SYMBOL CLOCK EXTRACTION
S37
SYMBOL CLOCK EXISTS ?
NO
AM
YES
LINEAR DIGITAL MODULATION TYPE
NO
(FM OR NON-LINEAR DIGITAL MODULATION TYPE)
S33
FM DETECTION PROCESSING
S34
SYMBOL CLOCK EXTRACTION
S35
SYMBOL CLOCK EXISTS ?
NO
FM
YES
NON-LINEAR DIGITAL MODULATION TYPE

FIG. 26